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(3) As the amount of copper in the Bordeaux mixture is decreased its value as a preventive is lessened.

(4) The application of the Bordeaux mixture should in all cases begin early, *i. e.*, about the time the flowers are opening.

(5) Spraying the vines before the leaves start with the simple solution of sulphate of copper is decidedly beneficial.*

ERYSIPHEÆ UPON PHYTOPTUS DISTORTIONS.

By F. W. ANDERSON and F. D. KELSEY.

Dr. Byron D. Halsted's note on *Sphærotheca* on Phytoptus distortions in the September Journal is interesting, and concludes by asking; "Have other Phytoptus growths been found infested with members of *Erysipheæ*?" So far as observations on the subject go in Montana an affirmative answer might be returned. In the article on Montana *Erysipheæ* in this number of the Journal by one of the writers, mention is made of *Sphærotheca Castagnei*, Lév. on *Shepherdia argentea* (Bull or Buffalo Berry), on *Geranium incisum*, and on *Erigeron Canadense*; also of *Sphærotheca mors-uvæ*, (Schw.) B. & C. on *Ribes rotundifolium*; the former fungus on *Shepherdia* and the latter fungus on *Ribes* were associated with the mites, and the peculiar powdery coating caused by these creatures in places almost covered the fungus. In both cases the distorted leaf axils, abnormally developed buds, and thickened brittle upper leaves bore the perithecia of largest size and in greatest numbers, leading us to the same natural conclusion as was formed in the mind of Dr. Halsted regarding the benefit received by the fungus through the unusual softening of the host tissues. Like him, too, we observed that on those portions of the host unaffected by the mite the fungus was only in an ordinary degree of development for that time of the year [July 10 for *S. Castagnei*, Lév., and June 8, or 9, for *S. mors-uvæ*, (Schw.) B. & C.]

On the *Geranium incisum* occurred also some mite together with the *S. Castagnei*, Lév., and again the fungus seemed to be more richly developed on the doubly affected parts. Late in the season the same fungus was found on *Erigeron Canadense*, and growing side by side with this host were plants of *Epilobium coloratum* badly affected by a mite, and the conidial form of an *Erysipheæ* which seemed to be *Sphærotheca Castagnei*, although no positive determination could be reached. On *Oxytropis Lamberti*, *Astragalus triphyllus*, and *Astragalus adsurgens*, *Erysiphe communis*, (Wallr.) Fr., has been frequently seen in company with a mite; while *Erysiphe cichoracearum*, DC., may be found at almost any time during the summer in connection with mites on *Chrysopsis villosa*, *Helianthus* (several species), *Oniscus undulatus*, *Erigeron macranthus*, and *Mertensia Sibirica*. In every case where these forms of animal

*Applicable only to this experiment.

and vegetable life are so associated there is a more vigorous development and more early maturing of the fungus than under ordinary circumstances. Let us hear from others on this interesting subject.

TREATMENT OF APPLE SCAB.

By B. T. GALLOWAY and E. A. SOUTHWORTH.

In May of last spring arrangements were made with the experiment stations of Michigan and Wisconsin to carry on a series of experiments for the purpose of finding a remedy for Apple Scab (*Fusicladium dendriticum*, Fekl.).

The fields of experiment were located at Lansing, Mich., on the College Farm, and at Ithaca, Richland County, Wis.; the work at the former place being under the direction of Professor Taft, Horticulturist of the College and Experiment Station, and at the latter under the general supervision of Professor E. S. Goff, Horticulturist of the Wisconsin Experiment Station, and in direct charge of Mr. A. L. Hatch, of Ithaca.

The season was a favorable one, as the weather was wet enough to favor the growth of the fungus and thus offered a fair test of the remedies employed.

The plan of work was drawn up at this Department and the same outline for the experiments was given to both. The instructions were very carefully carried out, and both experimenters have been unremitting in their diligence in making the applications and preserving accurate accounts of the results.

The fungicides used were sulphide of potassium, hyposulphite of soda, a soluble sulphur powder prepared by Mr. E. Bean, Jacksonville, Fla., ammoniacal solution of copper carbonate, and modified eau celeste. Professor Goff, however, did not use the eau celeste.

Both made seven applications; Professor Goff beginning May 18, and Professor Taft May 24, when the apples were about the size of peas and before any trace of scab was apparent. In regard to the time of beginning, Mr. Hatch says he is convinced that the applications should be started earlier, as he thinks fungus activity begins with the swelling of the buds. The varieties treated were the Northern Spy, by Professor Taft, and the Fameuse, by Professor Goff; both selected because they had been particularly troubled by scab previous to the present year.

With regard to the strength of the solutions employed, Professor Taft and Professor Goff both used the potassium sulphide in the proportions of one-half ounce to the gallon of water. The hyposulphite was used in both cases at the rate of 1 pound to 10 gallons. Professor Goff records some injury to the leaves from this strength, and on the fifth applica-